GEH-1191D
Supersedes GEH-1191C

INSTRUCTIONS

V-TYPE POLYPHASE WATTHOUR METERS

GENERAL ELECTRIC

TABLE OF CONTENTS

	Page
INTRODUCTION	3
INSTALLATION	3
"A" Construction Meters	3
"S" Construction Meters	4
SEALING THE METER	4
Covers for "S" Meters	4
Covers for Two-element "A" Meters	4
Covers for Three-element "A" Meters	4
CONTACT DEVICES	4
DEMAND REGISTERS	5
INSTRUMENT TRANSFORMERS	5
READING THE REGISTER	5
TESTING	6
Test Constant	6
CALIBRATING ADJUSTMENTS	6
Full Load	6
Light Load	6
Inductive Load	7
Torque Balance	7
MAINTENANCE	7
Bearings	7
1. Enclosed-type Ball Bearing	7
2. Oil-tight, Jewel-pivot Bearing	8
3. Upper Bearing	9
Register	9
Stator	9
POTENTIAL INDICATING LAMPS	9
OUTLINE AND MOUNTING DIMENSIONS	10—14
Type V-2	10—11
Type V-3, V-5, and V-6	12, 13
Type V-4, V-7, and V-10	14
SCHEMATIC CONNECTION DIAGRAMS	15—26
Type V-2	15
Type V-3	16—19, 24
Type V-4	20, 25
Type V-5	21, 22
Type V-6	23, 24
Type V-7	25
Type V-10	26
TERMINAL ARRANGEMENT AND MARKING	27—28
Type V-2	27
Type V-3, V-5, and V-6	27, 28
Type V-4, V-7, and V-10	28

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

V-TYPE POLYPHASE WATTHOUR METERS

TYPES V-2, V-3, V-4, V-5, V-6, V-7, V-10

INTRODUCTION

These instructions apply to General Electric two- and three-stator polyphase meters of the following types:

TYPE METER		NO. OF STATORS	CIRCUIT APPLICATION
Socket-connected	Bottom-connected		
V-2-S	V-2-A	2	3-wire network 3-wire; 1-, 2-, or 3-phase
V-3-S	V-3-A	2	3-wire; 1-, 2-, or 3-phase
-	V-4-A	3	4-wire Y; 3-phase
V-5-S	V-5-A	2	4-wire Y; 3-phase
V-6-S	V-6-A	2	4-wire △; 3-phase
-	V-7-A	3	4-wire △; 3-phase
-	V-10-A	3	Totalizing

Also covered are corresponding types of meters equipped with demand registers and with contact devices. Meters equipped with demand registers are identified by the additional type letter "M"; for example, VM-2-A. Meters equipped with contact devices are identified by the additional type letter "W"; for example, VW-2-A.

CROSS REFERENCE TO OTHER PUBLICATIONS

GEA-5878 ... How to Select Meter Sockets
GEH- 224 ... Instructions - Types D-5, D-12, and D-13 Contact Devices
GEH-1032 ... Instructions - Top-Bearing Detent
GEH-1451 ... Instructions - Type M-31 Demand Register
GEH-1529 ... Instructions - Type M-30 Demand Register
GET-813 ... How to Test and Adjust G-E A-c Watthour Meters
GET-1887 ... Constant and Register Ratio Data

INSTALLATION

All meters are factory-tested before shipment.

On Types V-4, V-7, and V-10 meters a shipping wedge is used to hold the rotor assembly stationary during shipment. Before placing meter in service, remove the shipping wedge. No adjustment of the bearings is necessary.

The meter should be installed in a place that is free from heavy vibration and excessive moisture and where there is light for reading the meter register.

The glass cover may be sealed independently before mounting the meter for service. Refer to SEALING THE METER, page 4.

The procedure given below should be observed when installing meters.

"A" Construction Meters

These meters have mounting and terminal chamber dimensions which conform to industry standards, and therefore can be used with all standard meter mountings intended for use with bottom-connected, multi-stator meters.

If used without a mount, proceed as follows:

1. Locate, and insert in the mounting surface, the top supporting screw. Use a round-head wood screw not smaller than No. 12 American Standard.
2. A reversible meter hanger is attached to the back of the base by a single screw. Adjust this hanger to the desired position and hang the meter by inserting the head of the supporting screw through the larger part of the keyhole opening. (See also step 5.)
3. Remove the terminal cover by sliding the seal strip to the left and loosening the two screws thus exposed.
4. Holes are provided in the lower corners of the base for insertion of the two bottom supporting screws. Level the meter by eye, insert the two lower supporting screws, and tighten in place. Use roundhead wood screws not smaller than No. 12 American Standard.
5. It is recommended that the meter base be grounded for safety. This is especially important on all meters used with instrument transformers. This can be done by using the top hanger in the external position, i.e., with the top mounting screw exposed. Secure the ground wire terminal between the head of this screw and the meter hanger. This connection should be completed before the external connections to the meter are made. Use No. 12 Awg copper wire for this ground.
6. Make the external connections to the meter in the manner indicated in the proper diagram included in this book. (For external connections of contact devices, refer to the instruction book covering the particular demand meter being operated by the contact device.) The connections should be made by working from right to left. This assures connection of the meter to its load circuit before line potential is applied. Disconnection of the meter should be made in the reverse order.
7. External connections should be made with conductors of sufficient size to carry the connected load

as prescribed by the National Electrical Code. The largest size conductor which will fit meter current terminals is No. 2 Awg stranded wire. For a load requiring a conductor size larger than No. 2, use the combination thimble and bushing Cat. No. 4124628G3.

"S" Construction Meters

1. Make sure that the meter socket is mounted securely in place and in such a position that the meter rotor shaft will be vertical when the meter is mounted.

2. Make the external connections to the socket terminals in the manner indicated in the proper diagram included in this manual. Connect the load wires first, and then the line wires. (For external connections of contact devices, refer to the instruction book covering the particular demand meter being operated by the contact device.)

3. Plug the meter into the socket, with the cover sealed separately if desired. Make sure that the terminal blades on the meter engage properly with the terminal clips in the socket. In order to assure connection of the meter to its load circuit before line potential is applied, always insert the meter *load* terminal blades into the socket terminal clips first; when removing, withdraw them last.

4. Push the meter well into place so that the base plate fits tightly against the socket rim. Place the metal sealing ring around the adjoining meter cover and socket rim. Position it so that the clamping screw is at the bottom of the meter, then tighten in place.

5. Seal the clamping screw of the sealing ring.

SEALING THE METER

Covers for "S" Meters, Types V-2-S, V-3-S, V-5-S, and V-6-S

The glass cover is attached to the meter by means of three lips, located on the bottom edge of the metal rim, which engage with corresponding projections on the steel base plate. A fraction of a turn clockwise is sufficient to seat the cover, with its weatherproof gasket, tight against the surface of the base plate. The special sealing screw can then be screwed into the nut attached to the cover gasket, which can be seen from the back of the meter through the slot available in the base plate.

Covers for Two-element "A" Meters, Types V-2-A, V-3-A, V-5-A, and V-6-A

The glass cover is held securely in place by means of three bayonet-type locking clips, located inside the metal ring, which engage with lugs cast on the outside of the base. A slight turn clockwise serves to seat the cover, with its weatherproof gasket, tight against the wide, circular rim of the the base. With the cover in this position, the cover seal-bar located on the right-hand top surface of the terminal chamber can be slid to the left, into its locking position. The metal cover for the terminal chamber can then be attached, and it will hold the cover seal-bar in the locked position. The two mounting screws for the terminal cover are exposed only when the sliding seal strip is moved to the left. After these screws have been tightened, they can be covered by moving the sliding strip to the right. Both the cover seal-bar and terminal-chamber seal strip can be secured in their locked positions, either separately or by means of a single meter seal of any standard form.

In the reverse order, it is necessary to remove the terminal-chamber cover before the meter cover can be unlocked and removed.

Covers for Three-element "A" Meters, Types V-4-A, V-7-A, and V-10-A.

The meter cover is held in position by two cams on the locking lever. These cams clamp on the back of the meter base when the locking lever is depressed. The locking lever is provided with a detachable locking nut which is engaged by the terminal-chamber cover. Thus, with the cover-locking lever depressed, the terminal-chamber cover can be attached, and it will hold the cover-locking lever in the locked position. The two screws for the terminal-chamber covers are exposed only when the sliding seal strip is moved to the left. After the screws have been tightened, they can be covered by moving the sliding strip to the right. The cover-locking levers and the terminal-chamber cover can each be sealed separately or, if the locking nut is left in place on the cover-locking lever, the meter can be sealed with a single meter seal on the terminal-chamber seal strip.

If it is desired to remove the glass cover without disturbing the seal on the terminal-chamber cover, it will be necessary to remove the locking nut from the cover-locking lever. This can easily be done, when the cover is off the meter, by removing the screw by which the locking nut is attached to the locking lever. With the locking nut removed, the terminal-chamber cover will no longer hold the glass cover in the locked position. Then the cover lock and the terminal-chamber sealing strip must each be sealed separately.

CONTACT DEVICES

The contact device for 2-element meters, Types VW-2-A, VW-3-A, VW-5-A, VW-6-A, VW-2-S, VW-3-S, VW-5-S, and VW-6-S, is mounted on the front of the meter frame, just below the meter register. A separate pair of mounting-screw holes is provided for this purpose.

The contact device for the 3-element meters, Types VW-4-A, VW-7-A, and VW-10-A, is mounted opposite the upper element on the left-hand side of the frame. A special mounting plate is provided.

The worm wheel of the contact device meshes with a special worm cut on the meter shaft. The 2-wire contact device has two leads, identified by the letters K and Z, while the 3-wire device has three leads, identified by K, Y, and Z.

Three contact device terminals, marked K, Y, and Z, are always provided in the terminal block of the "A" type meters. When a meter is equipped with a 2-wire contact device, only terminals K and Z need be used.

The "S" type meters have no provisions for extra terminals, so the contact device leads, either two or three, are brought out directly through the base-plate insulation. The first meters produced have three single leads passing through separate holes, while the later models are provided with a 3-conductor cable, terminating in a small, insulated plug and socket receptacle.

Refer to Instructions GEH-224 for information on contact devices.

DEMAND REGISTERS

Types VM-2-A, VM-3-A, VM-4-A, VM-5-A, VM-6-A, VM-7-A, VM-10-A, and the corresponding "S" type meters, VM-2-S, VM-3-S, VM-5-S, and VM-6-S, are equipped with demand registers.

The covers for VM-2-A, VM-3-A, VM-5-A, VM-6-A, and VM-2-S, VM-3-S, VM-5-S, and VM-6-S watthour demand meters are deeper than the corresponding watthour-meter covers, but are attached as described under SEALING THE METER. They are provided with resetting devices which can be sealed independently of the meter seals.

For 2-element meters the Type M-31 cumulative demand register requires a deeper cover than that designed for the Type M-30 sweep-hand indicating demand register. So the two styles of covers cannot be interchanged.

The covers for Types VM-4-A, VM-7-A, and VM-10-A are interchangeable for use with Types M-30 or M-31 demand registers, except for the resetting devices.

For instructions concerning M-30 and M-31 demand registers and their supplementary connections, refer to Instruction Manuals GEH-1529 and GEH-1451.

INSTRUMENT TRANSFORMERS

Both current and potential transformers have polarity markings of white paint, or markers H_1 for primary and X_1 for secondary, located on or near one primary and one secondary terminal. These markings denote relative polarity of the windings and indicate that the instantaneous direction of currents in the leads is the same; namely, toward the transformer in the marked primary lead, and from the transformer in the secondary lead, or vice versa. The polarity markings are shown in the connection diagrams and, in order to obtain correct direction of rotation of the watthour meters, must be followed regardless of their physical location on the transformers.

The bases of meters used with current and potential transformers, or with current transformers only, should be connected to the grounded side of the secondary circuit of such transformers. No. 12 Awg copper wire is suitable for this purpose. At the earth end of the wire the usual precautions employed in connection with lightning arresters should be followed.

Caution: *Under no conditions should the current circuit of a transformer-rated meter be opened without first short-circuiting the secondary winding of the current transformer.*

READING THE REGISTER

The pointer-type registers used on self-contained meters of the lower capacities read in kilowatt-hours directly. Those used on the higher-capacity meters require a dial-face multiplier, by which the register reading must be multiplied in order to obtain kilowatt-hours. This multiplier is usually 10 or 100 and is shown on the register face.

Transformer-rated meters are normally furnished with "primary-reading" registers when the instrument-transformer ratios are specified on the nameplate. These registers usually require a dial-face multiplier of 1, 10, 100, 1000, or higher.

When the instrument-transformer ratios are not specified, however, the meters are furnished with "secondary-reading" registers. The actual reading of these registers must be multiplied by the proper constant, which is the ratio of primary energy to secondary energy, in order to obtain kilowatt-hours. This constant is the product of the respective ratios of the current and potential transformers used with the meter.

The watthour constant (K_h) marked on the nameplate is for use only in calibrating and checking the meter, and must not be used in connection with the register reading.

When reading the pointer-type register, the position of each pointer must be determined accurately. In deciding upon the reading of each pointer, the pointer before it (to the right) must be observed. Unless this pointer has reached or passed the "0" or, in other words, completed a revolution, the pointer to its left has not completed the division upon which it may appear to rest. For this reason, the register can be read most easily and rapidly from right to left.

The demand registers may be either the sweep-hand or the cumulative type. Refer to Instructions GEH-1529 and GEH-1451 for reading these registers.

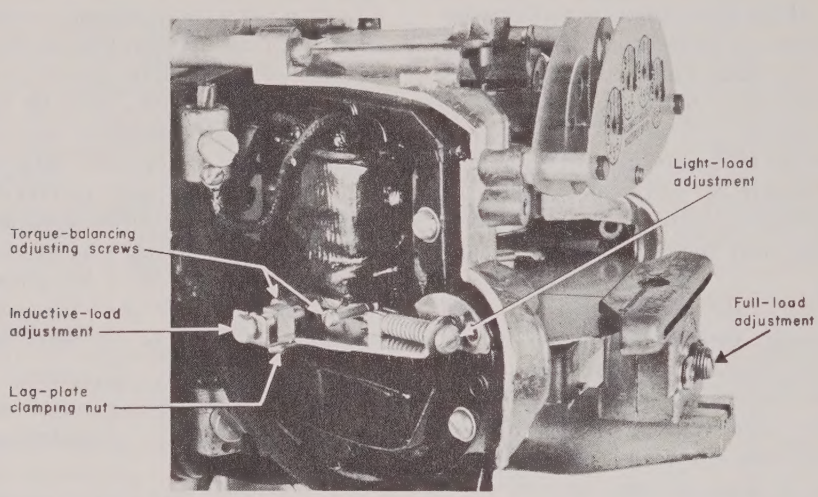


Fig. 1. Location of adjustment screws

TESTING

Detailed procedures for testing and adjusting General Electric a-c watthour meters are given in instruction book GET-813, which may be obtained upon application to the nearest sales office of the General Electric Company.

The portable watthour-meter standards manufactured by the General Electric Company provide means for making the necessary field tests quickly and accurately and independent of load variations. For testing in the meter shop, the G-E photo-electric meter tester provides both improved accuracy and savings in time. Details can be obtained by applying to the General Electric Company.

Test Constant

The watthour constant "K_h" marked on the nameplate is the number of watthours per revolution of the meter rotor. On the nameplates of transformer-rated meters, however, two watthour constants are shown; namely, "Test K" or "K_h" for use when testing the meter without transformers and the "Primary Test K" or "Primary K_h" as the over-all constant for the meter with its transformers.

CALIBRATING ADJUSTMENTS

The following adjustments are provided for calibrating the meters for all load conditions met in normal service.

Full Load

The adjustment of full-load calibration involves both a coarse and a fine adjustment of the retarding magnet. This full-load adjustment affects the meter calibration equally at all loads and power factors.

On Types V-2, V-3, V-5, and V-6 watthour meters, the course full-load adjustment is made by moving the retarding magnet in and out across the front edge of the meter disk. On Types V-4, V-7, and V-10 meters the adjustment is made by moving, in the same manner, the lower retarding magnet.

To adjust the retarding magnet, loosen the magnet clamping screw (located beneath the magnet supporting shelf) so as to allow the magnet to move along the supporting shelf. Starting with the magnet halfway along the shelf, move the magnet and calibrate until the meter calibration is within one per cent. Be sure to securely tighten the clamping screw at each trial. A 1/32" change in position of the magnet will change the meter speed approximately four per cent.

After the coarse adjustment has been made, the fine adjustment will complete the calibration of the meter. With the magnet clamping screw securely tightened, adjust the calibration within the required limits by turning the full-load adjustment screw (see Fig. 1). The letters "S" and "F" and corresponding arrows, shown on both the retarding magnet and the meter nameplate, indicate the proper direction to turn the screw. Turning the screw counterclockwise will increase the meter speed; turning clockwise will decrease it. One complete turn of the screw will change the calibration approximately 0.3 per cent.

During the adjustment or replacement of a retarding magnet, it is very important not to strike, clean, or support the magnet with magnetic objects.

Light Load

Light-load adjustment is made by moving the light-load plate sidewise, to the right or left, in the air gap of each stator. The effect of this adjustment varies inversely with the load torque. For example, a 5 per cent change at 1/10 full-load current appears as approximately 0.5 per cent change at full-load current, 1.00 power factor, and as approximately 1.0 per cent change at full-load current, 0.50 power factor.

The bracket supporting the light-load plate is mounted on the exposed face of each stator just above the disk, as shown in Fig. 1. Movement of the plate for each stator is controlled by an adjusting screw, which can be reached readily from the front of the meter. A spring device eliminates backlash and maintains the correct position after adjustment.

In order to change light-load adjustment, turn the adjusting screws counterclockwise to increase the speed of the meter, and clockwise to decrease it.

Inductive Load

Inductive-load adjustment is made by moving the lag plate in or out of the air gap of each stator. This adjustment is for inductive load only and should not be confused with the light-load adjustment described above. Whenever the inductive-load adjustment is changed, however, both full-load and light-load calibrations should be checked.

To change the inductive-load adjustment, first loosen the clamping nut (see Fig. 1). The lag plate can then be moved in or out in the proper direction, as shown by arrows and the letters "S" and "F" on the supporting bracket; that is, toward the rotor shaft to increase the meter speed and away from the shaft to decrease it. Turn the micrometer adjusting screw counterclockwise to increase the meter speed and clockwise to decrease it. When the proper adjustment has been obtained, tighten the clamping nut firmly, and check the inductive-load, full-load, and light-load calibrations.

Torque Balance

The torques of all stators are equalized at the factory by means of the steel adjusting screws located in the stator potential iron. The two screws for each stator are located just above the supporting bracket for the lag and light-load plates, and can be reached readily from the sides of the meter, as shown in Fig. 1.

Should it be necessary to make any change in this adjustment, the two screws of each stator should always be moved exactly the same number of turns and in the same direction. Turn the screws counterclockwise to increase the torque of the stator, and clockwise to decrease it. After adjustment between stators has been made, the accuracy of the meter should be checked on full load, light load, and inductive load.

MAINTENANCE

Bearings

1. *Enclosed-type Ball Bearing*

The enclosed-type ball bearing consists of a ball held between an upper and a lower jewel, the whole being enclosed in a protective sleeve, as shown in Fig. 2.

A. Lubrication. No lubrication is necessary with this type of meter bearing.

B. Replacement. At each test period the bearing should be disassembled and the jewels cleaned with corn pith and inspected for worn spots.

The following procedure, with reference to Fig. 2, is recommended for replacement of an enclosed-type ball bearing.

1. Remove the jewel-screw assembly by inserting a screw driver into the slot in the lower jewel screw (d) and backing out the screw. When the lower jewel screw (d) has been backed out, the section (a) will still be engaged in the split shaft or adapter. A pull is required to disengage it before the assembly can be removed. The force exerted need not be sufficient to bend the rotor disk. To remove the upper jewel assembly (a) and ball bearing (b) from the jewel-screw assembly, unscrew protective sleeve (c) with a pair of pliers.

The assembly of the bearing is readily accomplished by following the instructions below in steps 2-4.

2. Hold the sleeve (c) in one hand with the threaded end up and drop the upper jewel assembly (a) into the sleeve, making sure that the shoulder (f) is pulled through the small hole in the sleeve until it appears, as shown in Fig. 2.

3. Drop the ball into the sleeve (c), and it will then rest in the jewel cup of (a).

4. Screw in the lower jewel screw (d) and make sure that the sleeve (c) is tightened down firmly.

The assembly of the complete bearing in the watthour meter and the setting of the top bearing can be made as outlined below.

5. Screw the lower jewel screw (d) into the adjustable guide bushing (e), being careful to see that the upper jewel assembly (a) engages the hole in the adapter or the hole in the end of the split shaft.

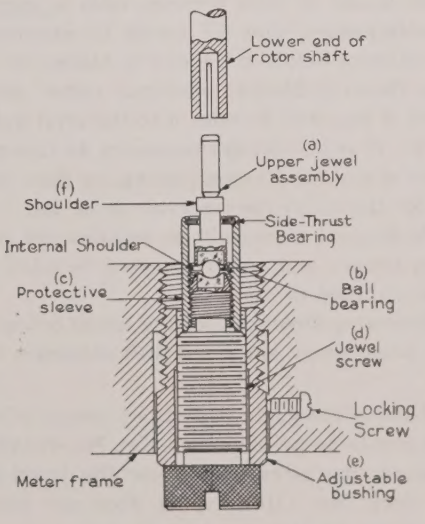


Fig. 2. Enclosed-type ball bearing

6. Loosen the top-bearing clamping screw and drop the bearing until it rests on the top of the shaft. Hold a finger on the top bearing.

7. Screw the lower jewel screw (d) into the guide bushing (e) until the shoulder (f) is snug up against either the adapter or the end of the split shaft. **Caution:** Too much pressure may damage the adapter or the shaft. For that reason it is suggested that the top-bearing clamping screw not be tightened, but that the pressure of a finger on the top bearing be used to push the upper jewel assembly (a) into the adapter or split shaft until the shoulder (f) is snug up against the end of the adapter or shaft.

8. Should the rotor disk need adjusting for proper clearance in the retarding-magnet gap, such adjustment can be accomplished by loosening the clamping screw of the guide bushing (e) and moving the guide bushing and jewel-screw assembly up or down, as desired.

9. Adjust the top bearing by positioning it 0.020 in. to 0.030 in. maximum above the top of the rotor shaft. Then tighten the clamping screw. Check the setting by measuring the up-travel of the rotor.

10. Always check the calibration of the meter if the bearings have been replaced or the position of the meter rotor has been changed in the magnet air gap.

2. *Oil-tight, Jewel-pivot Bearing*

The oil-tight, jewel-pivot bearing, Fig. 3, consists of a jewel, assembled within an adjustable bushing at the bottom of the meter frame, and a pivot which is screwed into the lower end of the rotor shaft.

A. Lubrication. All jewels shipped from the factory in meters are properly lubricated. Since meters may be stored for indefinite periods before use, and since the length of time between tests is increasing, it is recommended that all jewels be examined for proper oil level before the meter is placed in service and the General Electric watthour meter jewel oil be added, if required, to raise it to the level indicated in Fig. 3. It is not always necessary to disassemble the jewel screw for a second oiling, as there is little chance for the oil in the reservoir to be lost.

Jewels shipped separately as supplies are not oiled at the factory and must, therefore, be oiled before they are installed in meters.

The following directions for the initial oiling of the oil-tight jewel screw are given with reference to Fig. 3.

1. Remove the guide bushing by means of a combination jewel-and-pivot wrench, Cat. No. 4124390G1.

2. Invert the screw and allow the jewel-setting plug to drop out. If the plug does not drop out readily, gently tap the head of the screw.

3. By means of a wire-loop oil applicator, put two drops of G-E watthour meter jewel oil in the reservoir of the jewel screw. Allow a short time for the oil to run to the bottom of the reservoir. It is necessary that this reservoir under the jewel plug be filled.

4. Drop the jewel plug into the screw.

5. Replace the guide bushing and screw it down tightly.

6. Put in another drop of oil which will run down through the oil slot of the guide bushing into the jewel cup.

7. Inspect the oil level, which should be as shown in Fig. 3. Because of minor variations in mechanical dimensions of the reservoir or variation in the size of the drops obtained from the wire loop, three drops of oil cannot always be taken as the correct amount. If more is needed to fill to the right level, it should be added.

The pivots require no lubrication other than that obtained from properly oiled jewel screws.

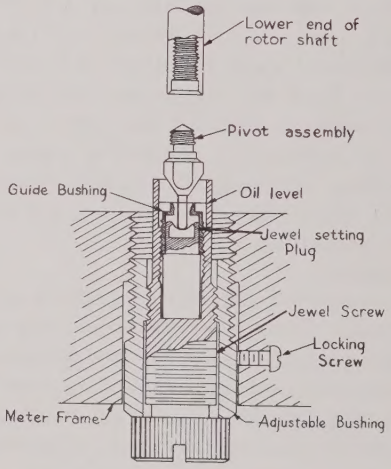


Fig. 3. Oil-tight, jewel-pivot bearing

B. Replacement. At each test period the jewel screw should be disassembled and the jewel inspected for worn spots, cleaned with corn pith, and reoiled with G-E watthour meter jewel oil.

If a meter requires a new lower bearing, both the pivot and the jewel should be changed. Pivots are injured by operation in badly worn or damaged jewels.

The following procedure is recommended for replacement of a pivot and jewel:

1. Loosen the top-bearing clamping screw so that the bearing is free to move.

2. Remove the jewel screw from its adjustable bushing. Do not disturb the setting of this bushing, since it is adjusted at the factory to provide proper

clearance of the meter disk in the magnet jaws when the jewel screw is screwed completely into it.

3. Insert the pivot-wrench end of a combination jewel-and-pivot wrench through the jewel-screw hole. Engage the pivot and unscrew.

4. Replace with a new pivot.

5. Disassemble the jewel screw, replace the jewel-setting plug with a new one, reassemble, and reoil according to instructions given previously.

6. Assemble the repaired jewel screw, or a new one, screwing it into the adjustable bushing as far as it will go.

7. Adjust the top bearing by positioning it 0.020 in. to 0.030 in. maximum above the top of the rotor shaft. Then tighten the clamping screw. Check the setting by measuring the up-travel of the rotor.

8. Always check the calibration of the meter if the bearings have been replaced or the position of the meter rotor has been changed in the magnet air gap.

3. *Upper Bearing*

The upper bearing consists of a guide pin mounted in an adjustable top bearing, and a guide bushing set into the tip of the rotor shaft.

The top bearing assembly is supplied with lubricant at the factory, and should require no attention during the normal life of the meter.

If adjustment or replacement of the top bearing is necessary, reset by positioning it 0.020 in. to 0.030 in. maximum above the top of the rotor shaft. Then tighten the clamping screw. Check the setting by measuring the up-travel of the rotor.

Register

The register dial face can be cleaned by the use of a cloth moistened slightly with water.

When replacing a register, carefully inspect the mesh of its worm wheel with the worm on the rotor shaft to see that it is approximately 1/3 to 1/2 the depth of tooth on the register worm wheel. If it is not, a means for its adjustment is provided in the eccentric adjusting screw in the bracket on the back of the register. Avoid meshing too deeply, for this might cause friction and affect the accuracy of the meter.

The use of oil on the bearings of watthour-meter registers is not recommended.

Refer to Instructions GEH-1529 and GEH-1451 for the proper care of the Types M-30 and M-31 demand registers.

Stator

If a potential or current coil is damaged, the entire stator should be replaced.

POTENTIAL INDICATING LAMPS

Meters rated for use with instrument transformers are furnished with potential indicating lamps. These are connected to isolated secondary windings on the potential coil cores, so that they give a positive indication of the presence of potential magnetic flux in the stator core.

CONNECTION DIAGRAMS

The diagrams in this book show approved methods of wiring the apparatus. Other methods which are electrically equivalent are possible and, for particular installations may result in more economical wiring. When the meter is connected properly in the circuit, the rotor rotates counterclockwise as viewed from above.

OUTLINE AND MOUNTING DIMENSIONS

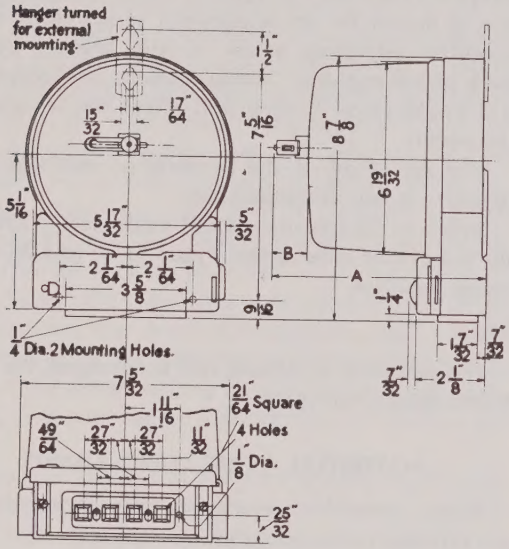
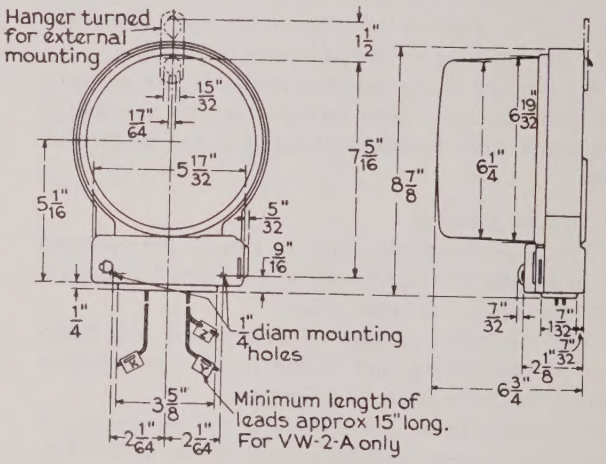


Fig. 4. Type VM-2-A meter

Table of Dimensions (Fig. 4)

Type of Demand Register	DIMENSIONS IN INCHES	
	A	B
M-30	8 15/32	27/32
M-31	9 11/16	1 1/4



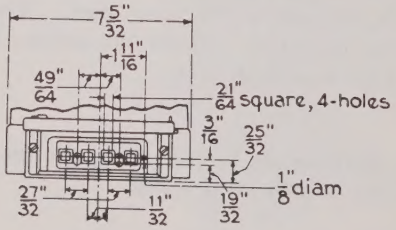


Fig. 5. Types V-2-A and VW-2-A meters

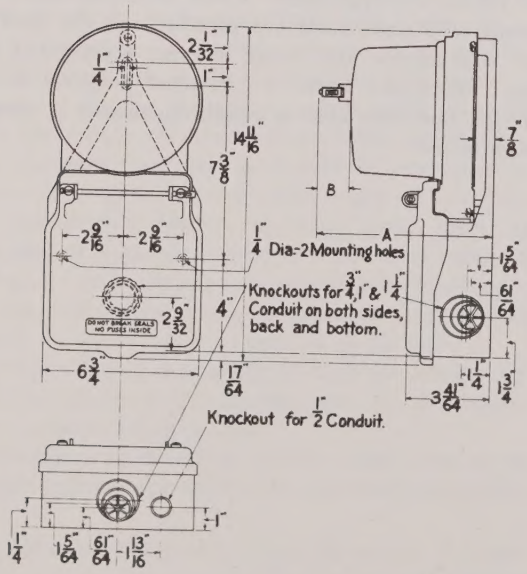


Fig. 6. Types V-2-A, VW-2-A, and VM-2-A meters in the all-service mounting

Table of Dimensions (Fig. 6)

Meter Types	DIMENSIONS IN INCHES	
	A	B
V-2-A and VW-2-A	7 5/8	
VM-2-A with M-30 Demand Register	9 11/32	27/32
VM-2-A with M-31 Demand Register	10 9/16	1 1/4

OUTLINE AND MOUNTING DIMENSIONS

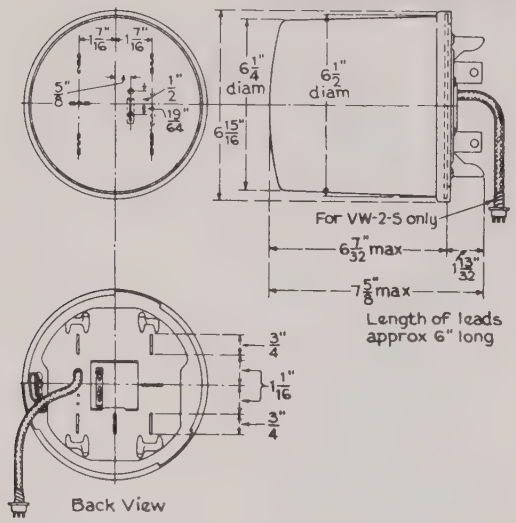
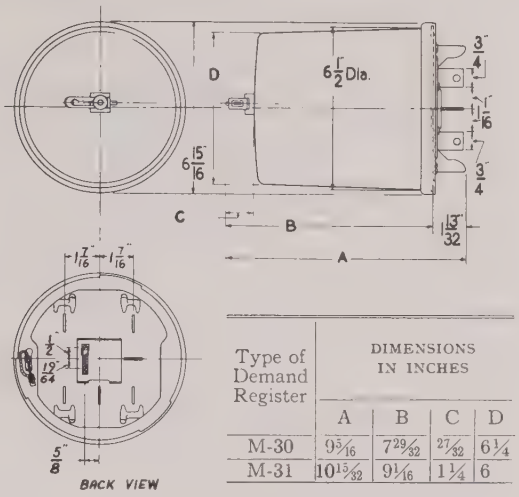


Fig. 7. Types V-2-S and VW-2-S meter units



Type of Demand Register	DIMENSIONS IN INCHES			
	A	B	C	D
M-30	$9\frac{5}{16}$	$7\frac{29}{32}$	$2\frac{7}{32}$	$6\frac{1}{4}$
M-31	$10\frac{15}{32}$	$9\frac{1}{16}$	$1\frac{1}{4}$	6

Fig. 8. Type VM-2-S meter unit

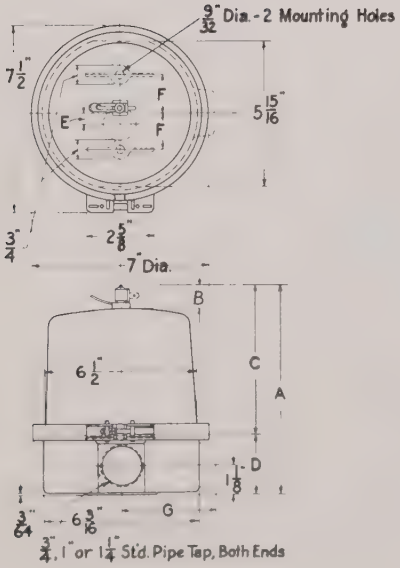


Table of Dimensions (Fig. 9)
Types V-2-S and VW-2-S Watthour Meters

Standard Sockets	DIMENSIONS IN INCHES						
	A	B	C	D	E	F	G
2-outlet, ¾-in., 1-in., or 1¼-in. conduit	$8\frac{15}{16}$	—	$6\frac{7}{32}$	$2\frac{23}{32}$	—	$1\frac{15}{16}$	—
2-outlet with back breakout, ¾-in., 1-in., or 1¼-in. conduit	$8\frac{15}{16}$	—	$6\frac{7}{32}$	$2\frac{23}{32}$	$\frac{7}{16}$	$1\frac{15}{16}$	—
3-outlet with back breakout, ¾-in., 1-in., or 1¼-in. conduit	$8\frac{15}{16}$	—	$6\frac{7}{32}$	$2\frac{23}{32}$	$\frac{7}{16}$	$1\frac{15}{16}$	$3\frac{3}{4}$

Type VM-2-S Watthour Demand Meter With M-30 Demand Register

Standard Sockets	DIMENSIONS IN INCHES						
	A	B	C	D	E	F	G
2-outlet, ¾-in., 1-in., or 1¼-in. conduit	$10\frac{5}{8}$	$2\frac{7}{32}$	$7\frac{29}{32}$	$2\frac{23}{32}$	—	$1\frac{15}{16}$	—
2-outlet with back breakout, ¾-in., 1-in., or 1¼-in. conduit	$10\frac{5}{8}$	$2\frac{7}{32}$	$7\frac{29}{32}$	$2\frac{23}{32}$	$\frac{7}{16}$	$1\frac{15}{16}$	—
3-outlet with back breakout, ¾-in., 1-in., or 1¼-in. conduit	$10\frac{5}{8}$	$2\frac{7}{32}$	$7\frac{29}{32}$	$2\frac{23}{32}$	$\frac{7}{16}$	$1\frac{15}{16}$	$3\frac{3}{4}$

Type VM-2-S Watthour Demand Meter With M-31 Demand Register

Standard Sockets	DIMENSIONS IN INCHES						
	A	B	C	D	E	F	G
2-outlet, ¾-in., 1-in., or 1¼-in. conduit	$11\frac{25}{32}$	$1\frac{1}{4}$	$9\frac{1}{16}$	$2\frac{23}{32}$	—	$1\frac{15}{16}$	—
2-outlet with back breakout, ¾-in., 1-in., or 1¼-in. conduit	$11\frac{25}{32}$	$1\frac{1}{4}$	$9\frac{1}{16}$	$2\frac{23}{32}$	$\frac{7}{16}$	$1\frac{15}{16}$	—
3-outlet with back breakout, ¾-in., 1-in., or 1¼-in. conduit	$11\frac{25}{32}$	$1\frac{1}{4}$	$9\frac{1}{16}$	$2\frac{23}{32}$	$\frac{7}{16}$	$1\frac{15}{16}$	$3\frac{3}{4}$

Fig. 9. Type V-2-S, VM-2-S, and VW-2-S meter units mounted in standard meter sockets.
Note: For further information concerning meter sockets, refer to G-E Manual GEA-5878

OUTLINE AND MOUNTING DIMENSIONS

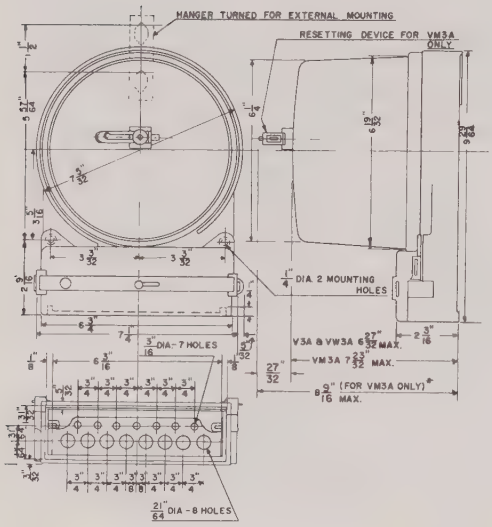

HANGER TURNED FOR EXTERNAL MOUNTING
RESETTING DEVICE FOR VM3A ONLY
1/4" DIA 2 MOUNTING HOLES
3/16" DIA - 7 HOLES
21/64" DIA - 8 HOLES
V3A & VW3A 6 27/32" MAX.
VM3A 7 23/32" MAX.
8 9/16" MAX. (FOR VM3A ONLY)

Fig. 10. Types V-3-A, V-5-A, V-6-A, VW-3-A, VW-5-A, and VW-6-A meters. Above dimensions also apply to Types VM-3-A, VM-5-A, and VM-6-A when equipped with Type M-30 demand register

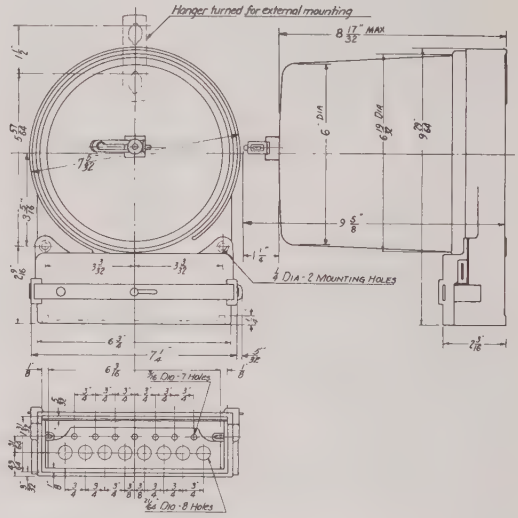


Fig. 11. Types VM-3-A, VM-5-A, and VM-6-A meters with Type M-31 demand register

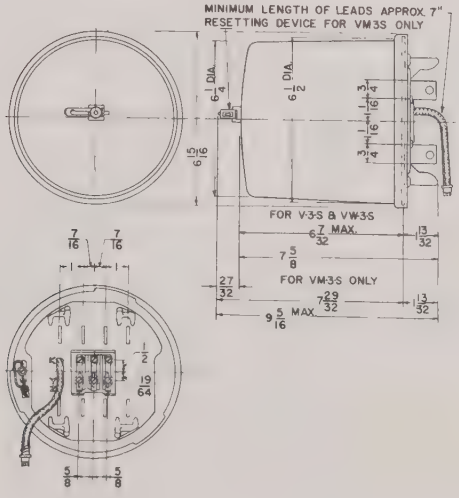


Fig. 12. Types V-3-S, V-5-S, V-6-S, VW-3-S, VW-5-S, and VW-6-S meter units. Above dimensions also apply to to Types VM-3-S, VM-5-S, and VM-6-S when equipped with Type M-30 demand register

OUTLINE AND MOUNTING DIMENSIONS

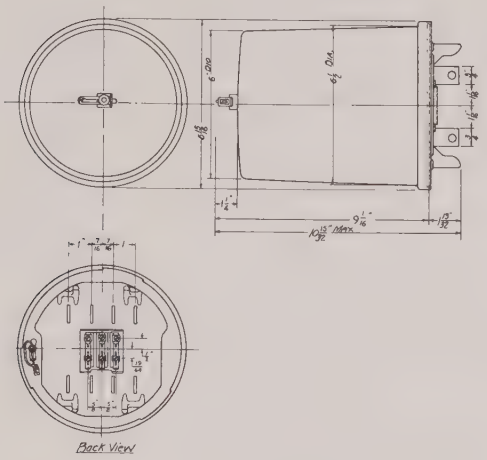


Fig. 13. Types VM-3-S, VM-5-S, and VM-6-S meter units with Type M-31 demand register

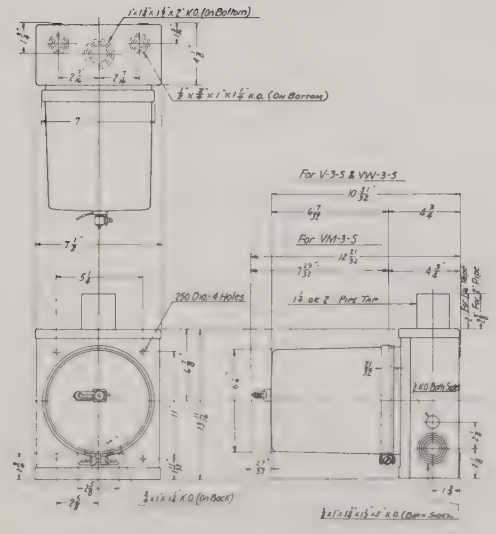


Fig. 14. Types V-3-S, V-5-S, V-6-S, VW-3-S, VW-5-S, and VW-6-S meter units mounted in socket. Above dimensions also apply to Type VM-3-S, VM-5-S, and VM-6-S when equipped with Type M-30 demand register. Note: For further information concerning meter sockets, refer to G-E Manual GEA-5878

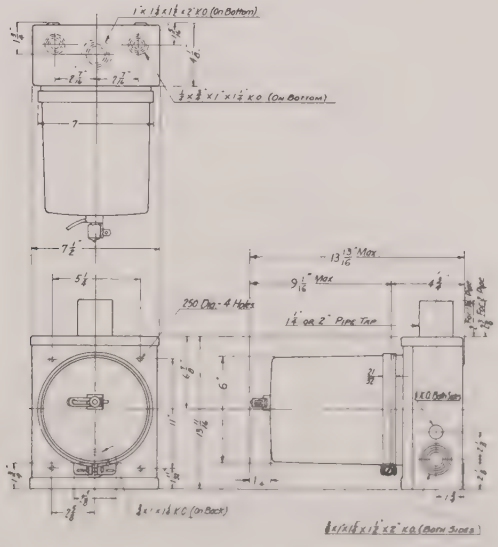


Fig. 15. Types VM-3-S, VM-5-S, and VM-6-S meter units with Type M-31 demand register; mounted in socket. Note: For further information concerning meter sockets, refer to G-E Manual GEA-5878

OUTLINE AND MOUNTING DIMENSIONS

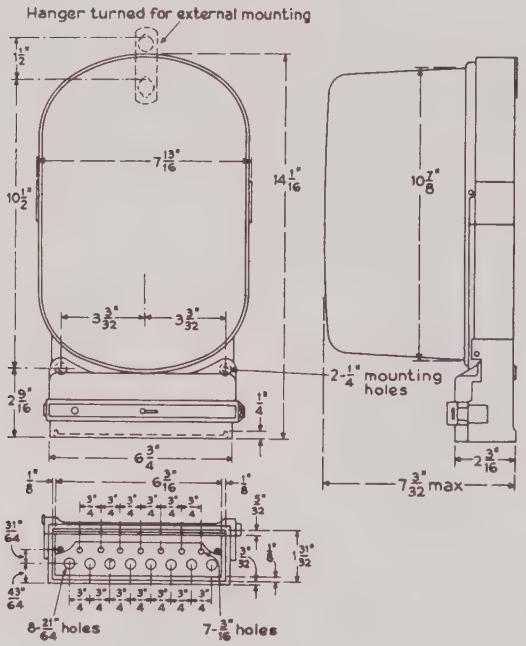


Fig. 16. Types V-4-A, V-7-A, and V-10-A meters; also Types VW-4-A, VW-7-A, and VW-10-A

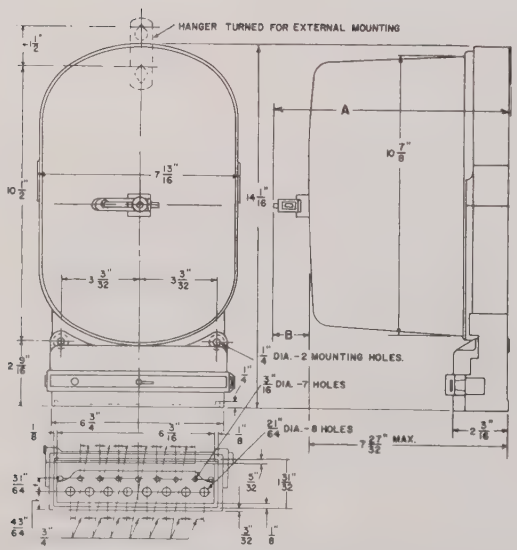


Table of Dimensions

Meter Types	DIMEN. IN IN.	
	A	B
VM-4-A with M-30 Register	$8\frac{11}{16}$	$\frac{27}{32}$
VM-4-A with M-31 Register	$9\frac{3}{32}$	$1\frac{1}{4}$

Fig. 17. Types VM-4-A, VM-7-A, and VM-10-A meters with Types M-30 and M-31 demand registers

SCHEMATIC CONNECTION DIAGRAMS

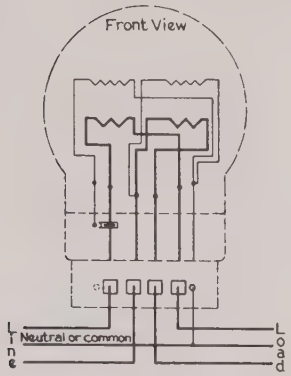


Fig. 18. Type V-2-A meter for 3-wire circuits. (Note: Test link should be closed)

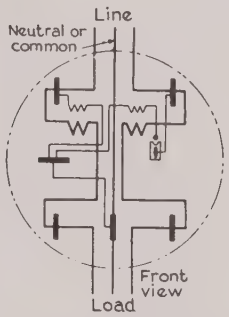


Fig. 19. Type V-2-S meter for 3-wire circuits. (Note: Test link should be closed)

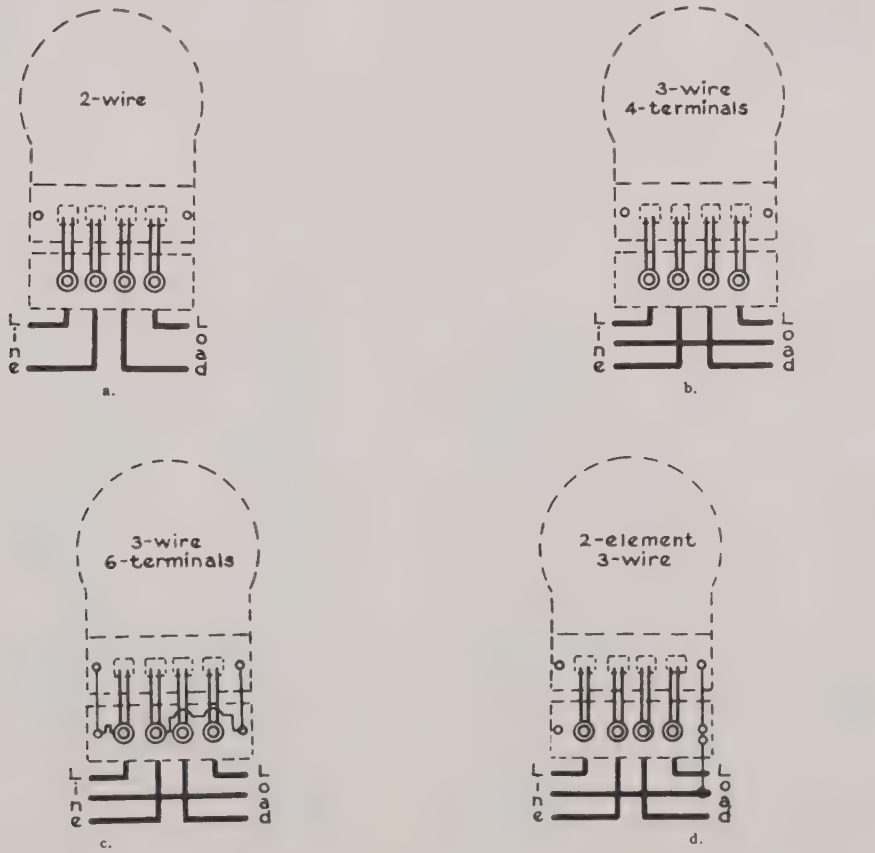
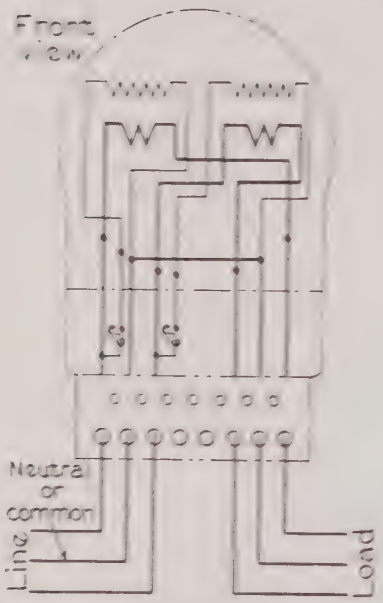


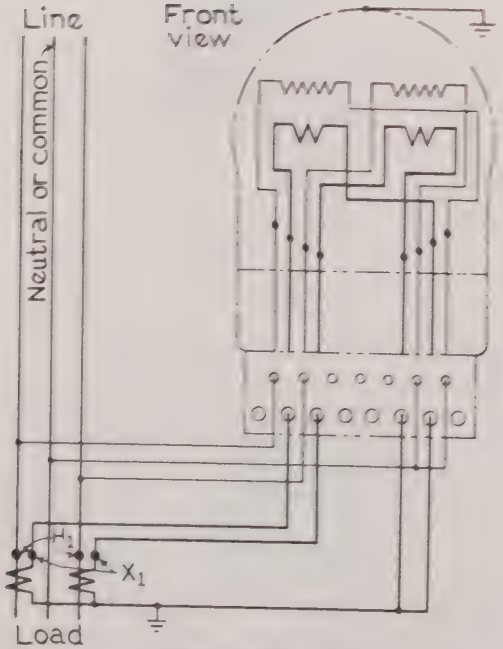
Fig. 20. Die-cast diagrams on inside of cover for connection box used with all-service mounting (Diagrams a, b, and c are for single-phase meters only. Diagram d is for the Type V-2-A meter)

SCHEMATIC CONNECTION DIAGRAMS

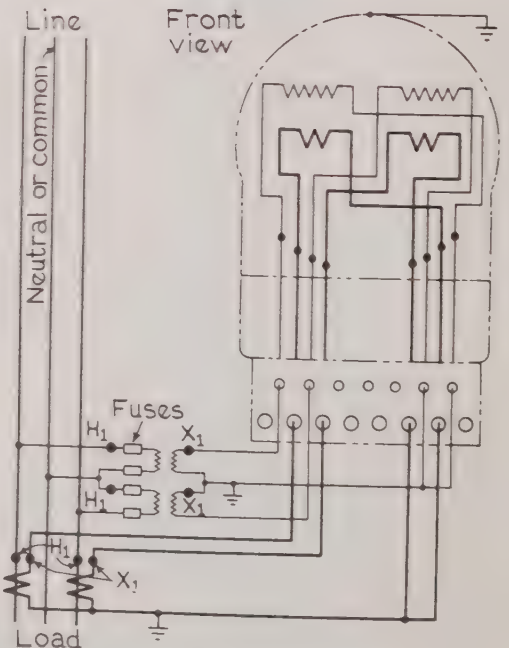


a. Without transformers

Fig. 21. Type V-3-A meter for 3-wire 3-phase, 3-wire 2-phase, or 3-wire single-phase circuits. (Note: Test links should be closed)

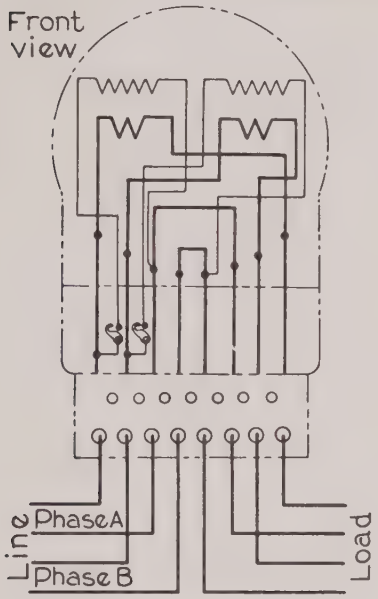


b. With current transformers



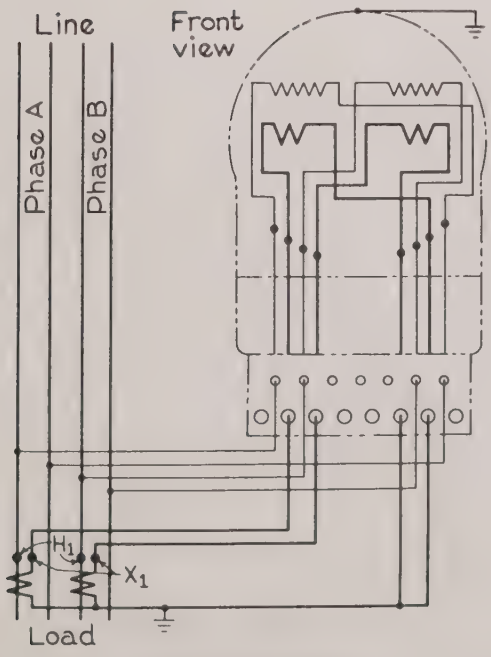
c. With current and potential transformers

SCHEMATIC CONNECTION DIAGRAMS

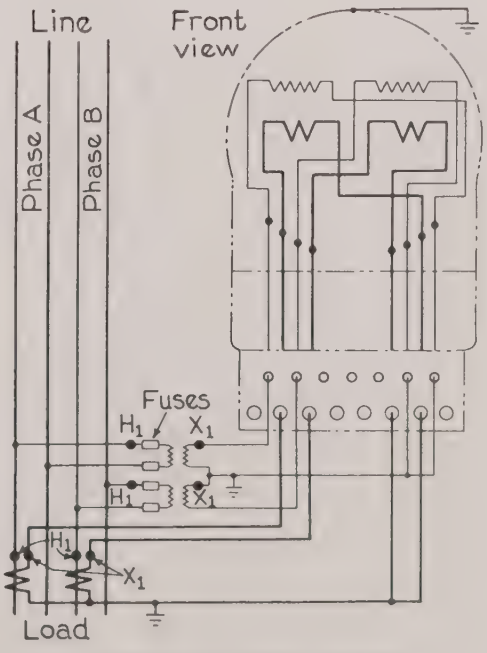


a. Without transformers

Fig. 22. Type V-3-A meter for 4-wire, 2-phase circuits (Note: Test links should be closed)

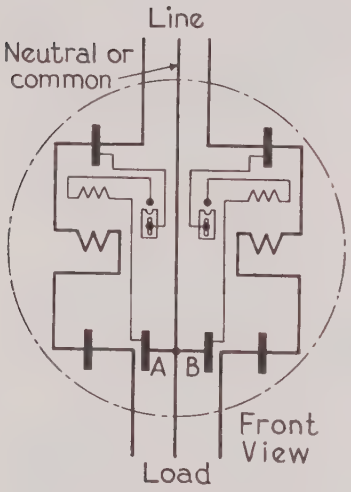


b. With current transformers



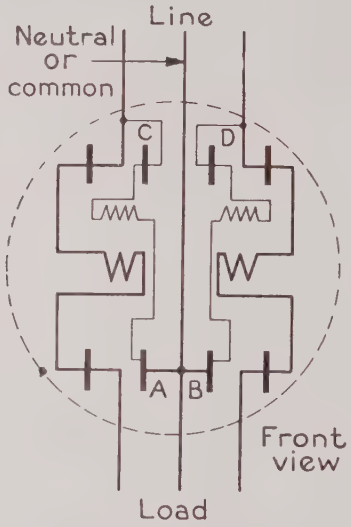
c. With current and potential transformers

SCHEMATIC CONNECTION DIAGRAMS



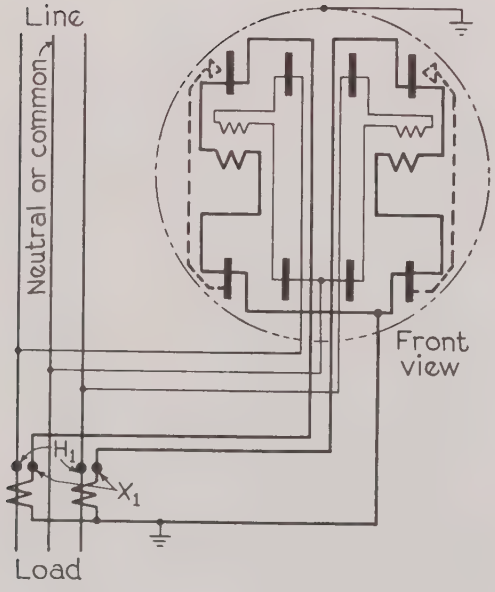
a. Without transformers for meters below Serial No. 20111350

NOTE: Make jumper connection **AB** in socket.

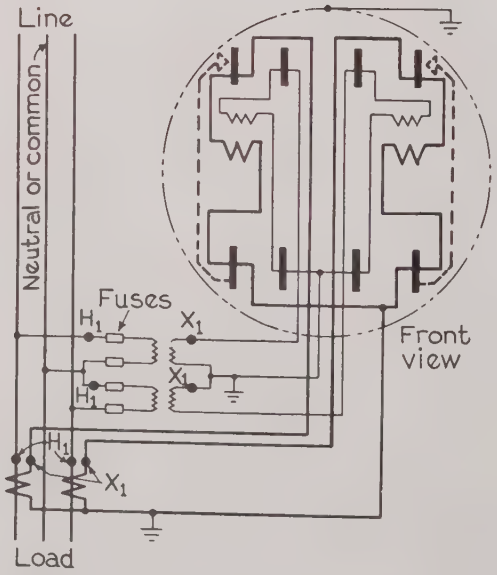


b. Without transformers for meters Serial No. 20111350 and above

NOTE: Make jumper connection **A, B, C,** and **D** in socket



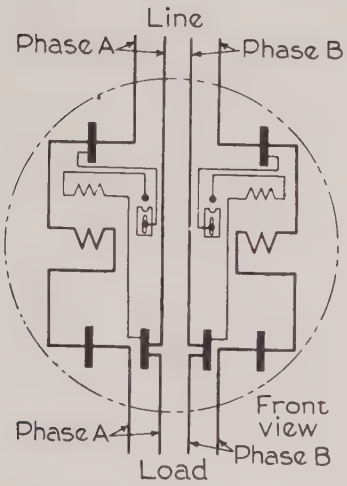
c. With current transformers



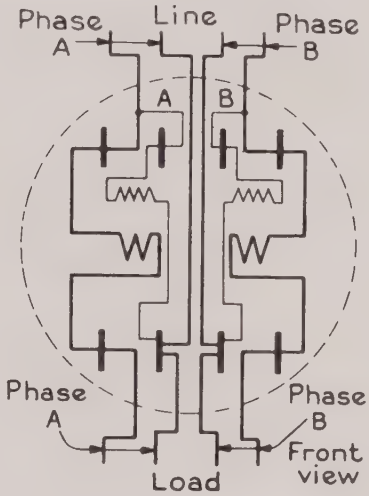
d. With current and potential transformers

Fig. 23. Type V-3-S meter for 3-wire 3-phase, 3-wire 2-phase, or 3-wire single-phase circuits (Note: Test links should be closed)

SCHEMATIC CONNECTION DIAGRAMS

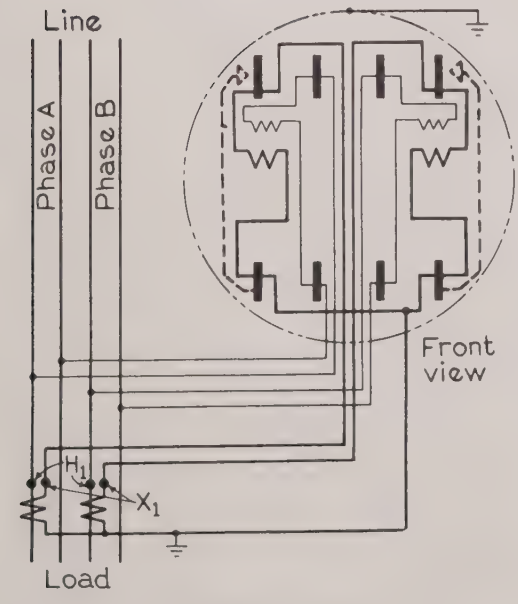


a. Without transformers for meters below Serial No. 20111350

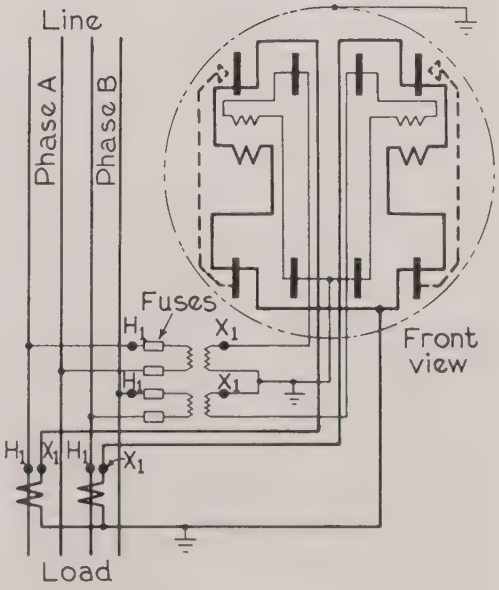


b. Without transformers for meters Serial No. 20111350 and above

NOTE: Make jumper connection A and B in socket



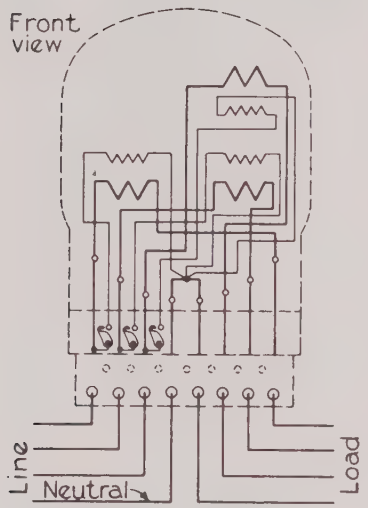
c. With current transformers



d. With current and potential transformers

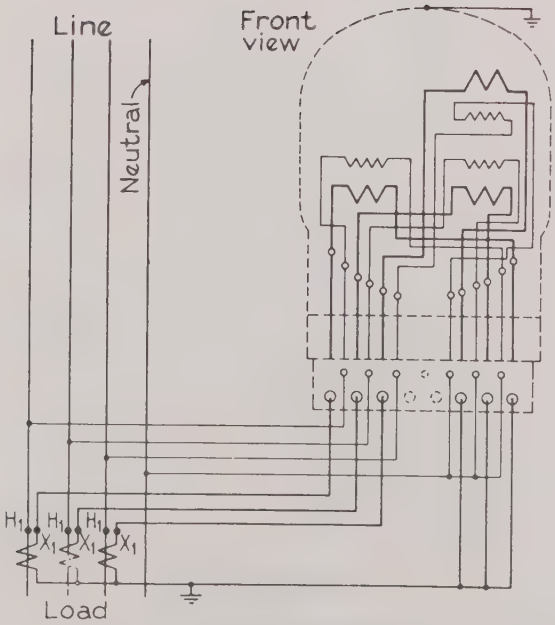
Fig. 24. Type V-3-S meter for 4-wire, 2-phase circuits (Note: Test links should be closed)

SCHEMATIC CONNECTION DIAGRAMS

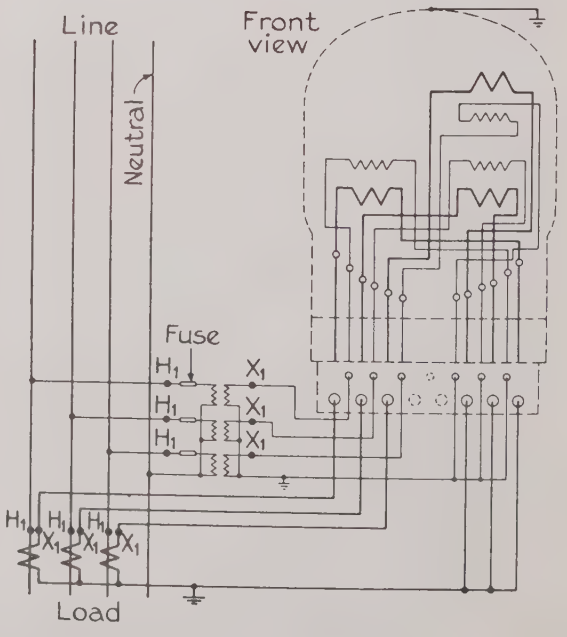


a. Without transformers

Fig. 25. Type V-4-A meter for 4-wire Y, 3-phase circuits (Note: Test links should be closed)

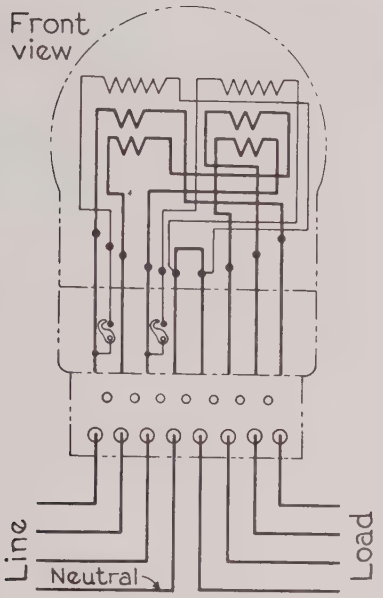


b. With current transformers



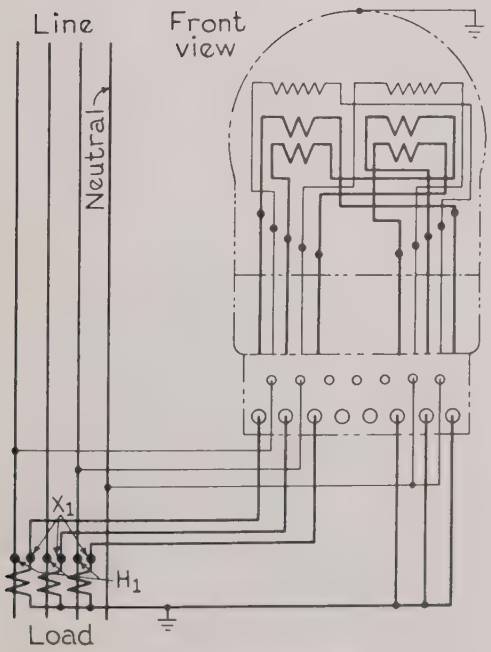
c. With current and potential transformers

SCHEMATIC CONNECTION DIAGRAMS

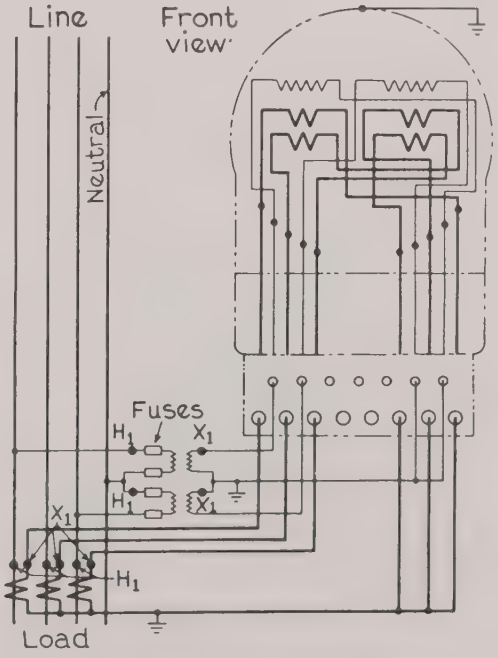


a. Without transformers

Fig. 26. Type V-5-A meter for 4-wire Y, 3-phase circuits (Note: Test links should be closed)

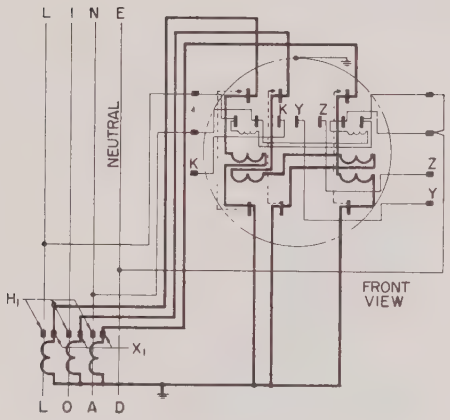


b. With current transformers

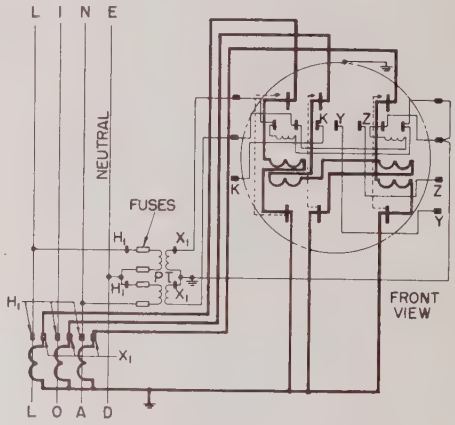


c. With current and potential transformers

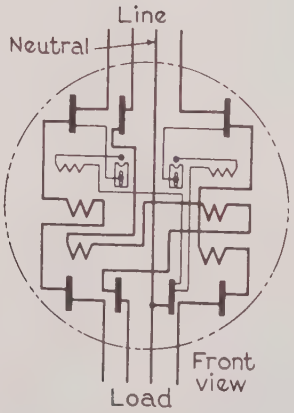
SCHEMATIC CONNECTION DIAGRAMS



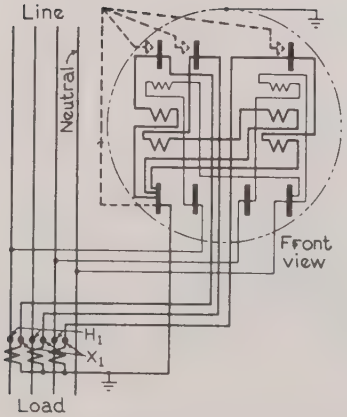
a. With current transformers (13-terminal base)



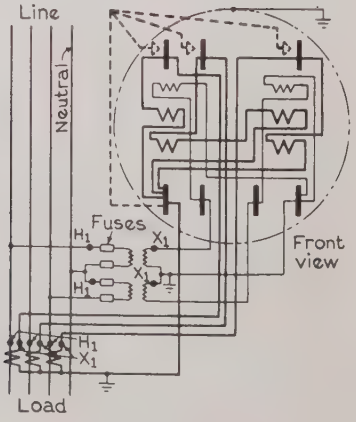
b. With current and potential transformers (13-terminal base)



c. Without transformers



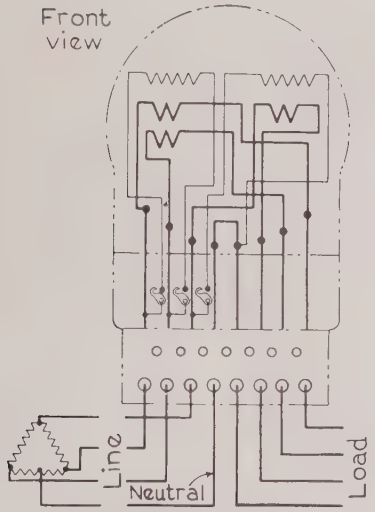
d. With current transformers



e. With current and potential transformers

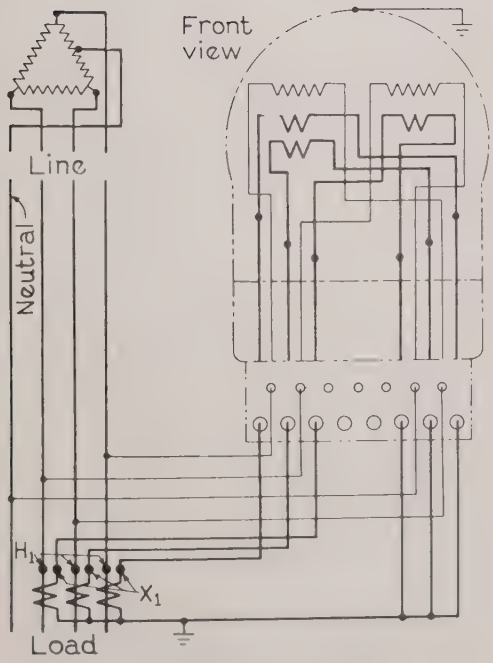
Fig. 27. Type V-5-S meter for 4-wire Y, 3-phase circuits (Note: Test links should be closed)

SCHEMATIC CONNECTION DIAGRAMS

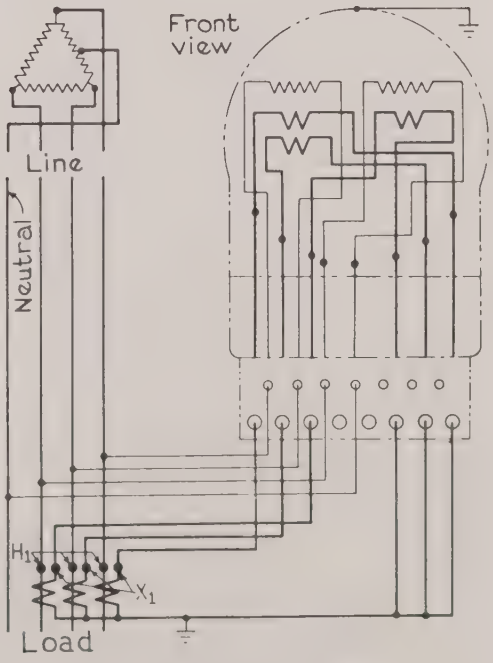


a. Without transformers

Fig. 28. Type V-6-A meter for 4-wire △, 3-phase circuits (Note: Test links should be closed)

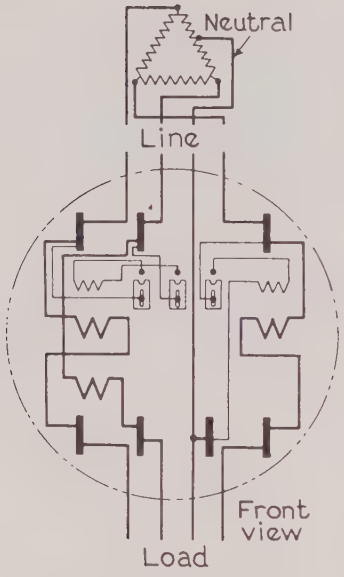


b. With current transformers for meters below Serial No. 20528047

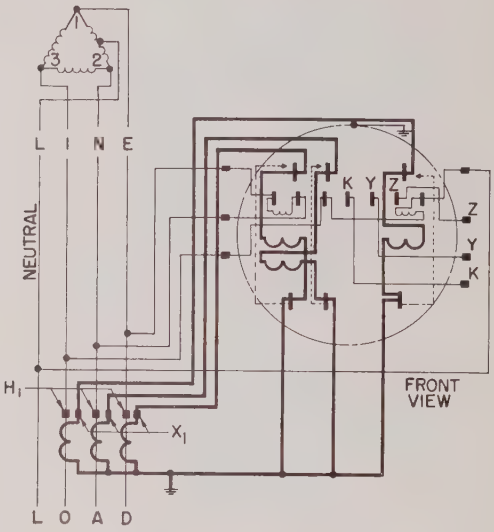


c. With current transformers for meters Serial No. 20528047 and above

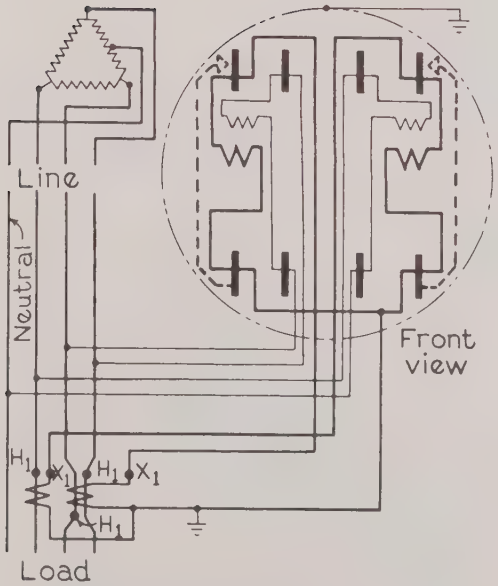
SCHEMATIC CONNECTION DIAGRAMS



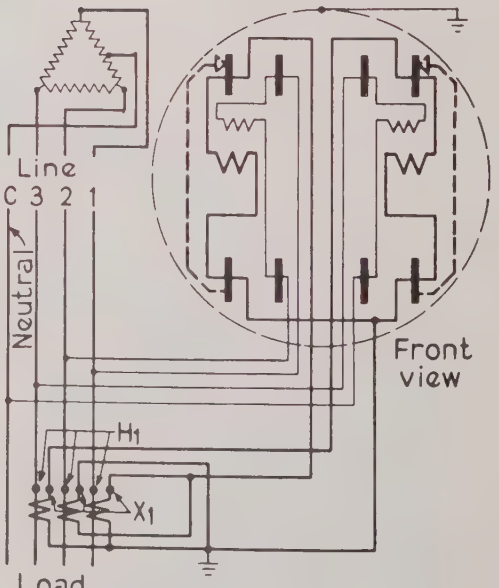
a. Without transformers (Type V-6-S)



b. With current transformers (Type V-6-S)



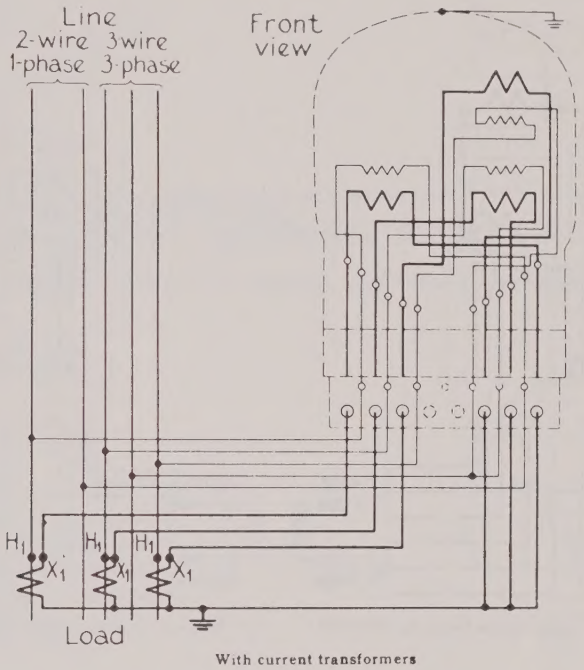
b. With current transformers (Type V-3-S, 3-wire, 3-phase meter with one 3-wire and one regular current transformer)



c. With current transformers (Type V-3-S, 3-wire, 3-phase meter. Current transformers in Lines 1 and 2 have twice the ratio of that in Line 3)

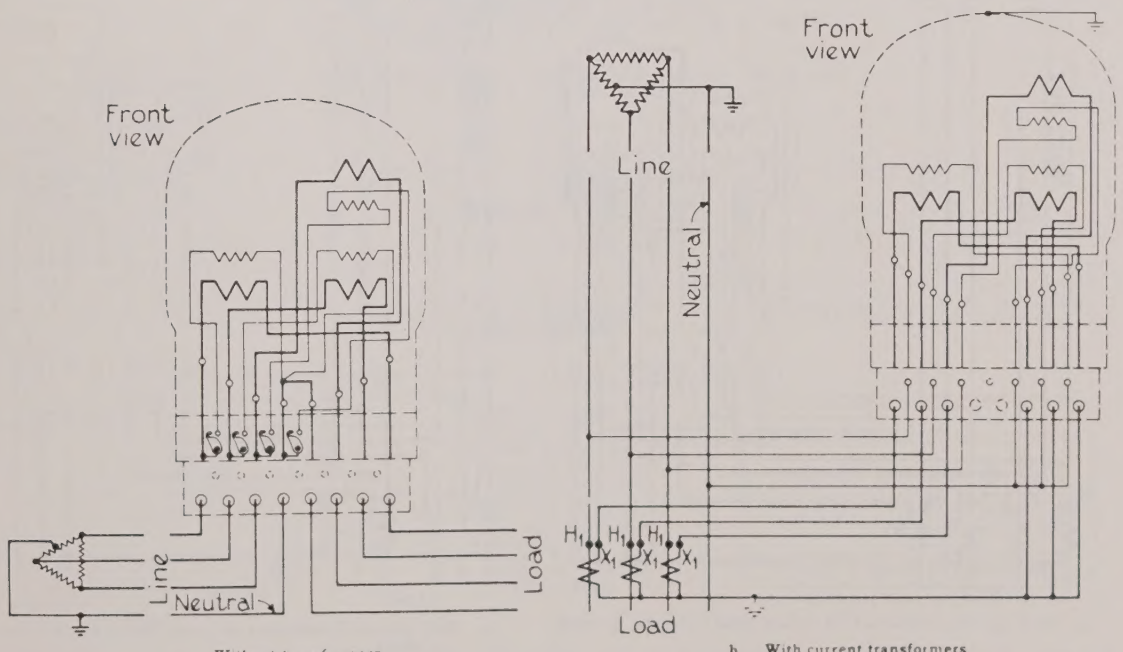
Fig. 29. Types V-6-S and V-3-S meters for 4-wire △, 3-phase circuits. (Note: Test links should be closed)

SCHEMATIC CONNECTION DIAGRAMS



With current transformers

Fig. 30. Type V-4-A meter for totalizing one 3-wire, 3-phase circuit and one 2-wire, single-phase circuit

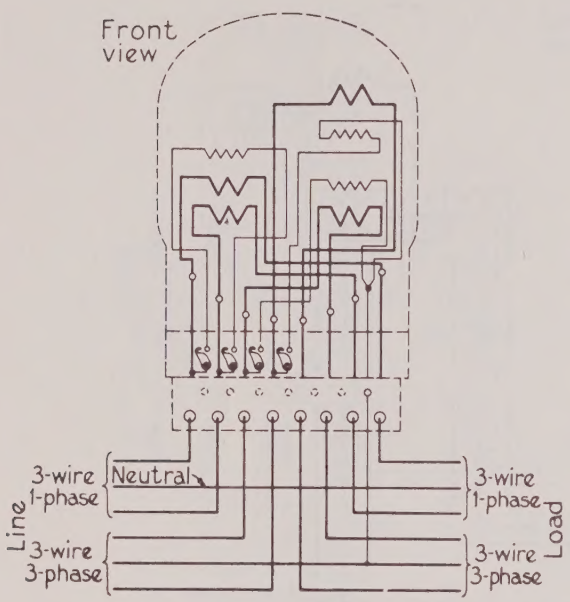


a. Without transformers

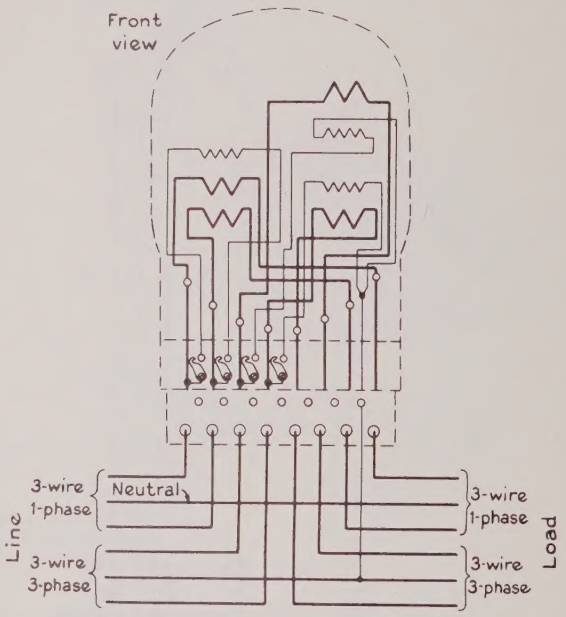
b. With current transformers

Fig. 31. Type V-7-A meter for 4-wire△, 3-phase circuits (Note: Test links should be closed)

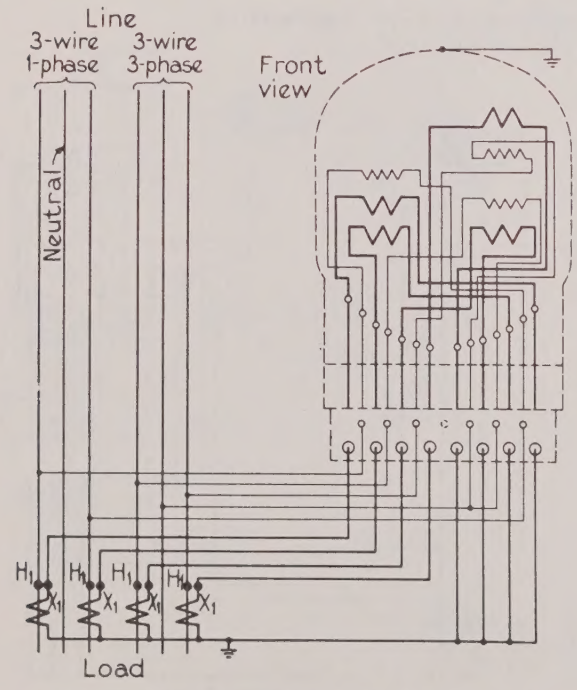
SCHEMATIC CONNECTION DIAGRAMS



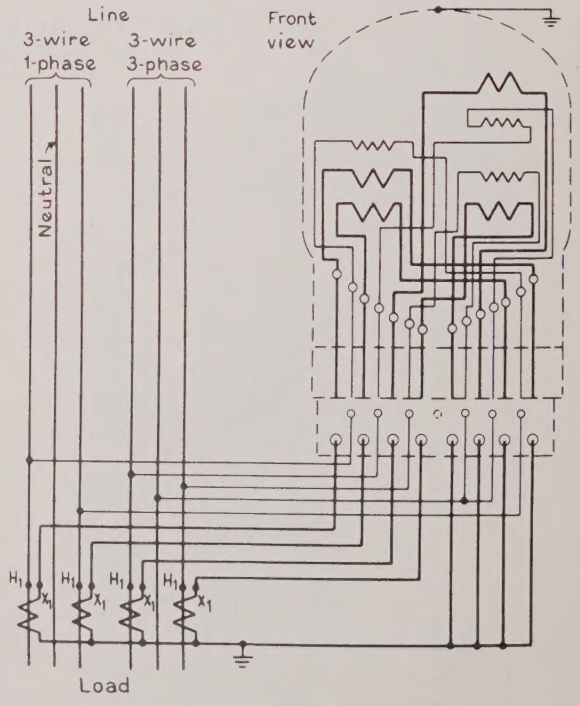
a. Without transformers for meters below Serial No. 22917569



b. Without transformers for meters Serial No. 22917569 and above



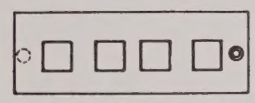
c. With current transformers for meters below Serial No. 22917569



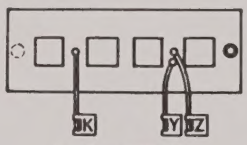
d. With current transformers for meters Serial No. 22917569 and above

Fig. 32. Type V-10-A meter for totalizing one 3-wire, 3-phase circuit and one 3-wire, single-phase circuit (Note: Test links should be closed)

TERMINAL ARRANGEMENT AND MARKING



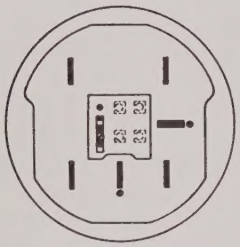
a. Types V-2-A and VM-2-A



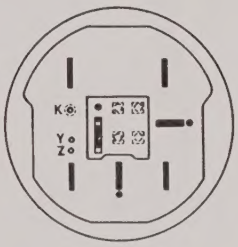
b. Type VW-2-A

Notes:
1. Potential terminals identified by white markings, ◎.
2. For Type VW-2-A meters only:
   a. Leads K, Y, and Z are furnished for 3-wire contact devices.
   b. Leads K and Z are furnished for 2-wire contact devices.

Fig. 33. Types V-2-A, VW-2-A, and VM-2-A meters



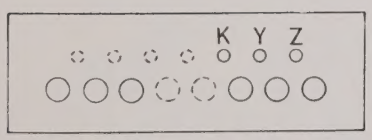
a. Types V-2-S and VM-2-S



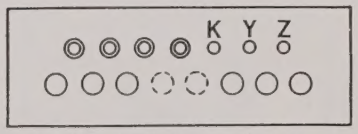
b. Type VW-2-S

Notes:
1. Potential terminals identified by white markings, ●
2. For Type VW-2-S only:
   a. Contact device leads are identified by red marking.
   b. Leads K, Y, and Z are used for 3-wire contact devices.
   c. Leads K and Z are used for 2-wire contact devices.
   d. Circle ○ indicates location of 3-conductor cable for contact device connections.

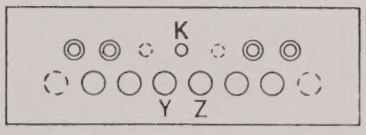
Fig. 34. Types V-2-S, VW-2-S, and VM-2-S meters. (Back views)



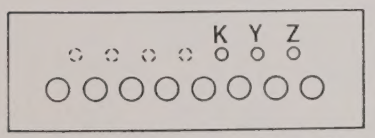
a. Type V-3-A, 3-wire, 1-, 2-, and 3-phase (without transformers)



b. Type V-6-A, 4-wire △, 3-phase (with transformers) Serial No. 20528047 and above



c. Type V-3-A, 3-wire, 1-, 2-, and 3-phase, and 4-wire, 2-phase (with transformers)



d. Type V-3-A, 4-wire, 2-phase; Type V-5-A, 4-wire Y, 3-phase; and Type V-6-A 4-wire △, 3-phase (without transformers)

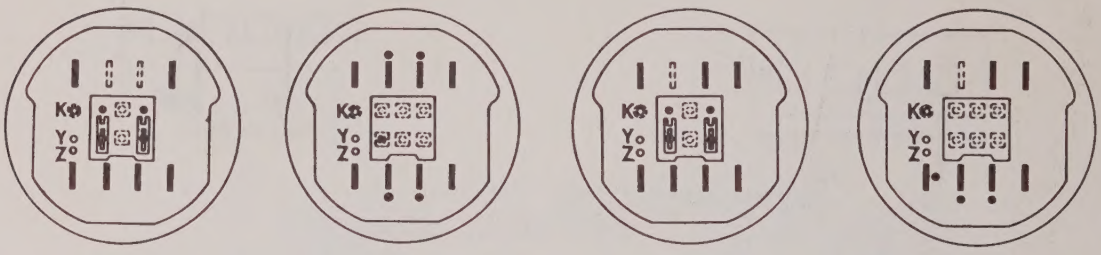
NOTES:
1. Potential terminals are identified by white markings, ◎.
2. On VW meters only:
   a. Terminals K, Y, and Z are used for 3-wire contact devices.
   b. Terminals K and Z are used for 2-wire contact devices.
   c. Contact-device terminals are identified by red marking.

e. Type V-5-A, 4-wire Y, 3-phase; and Type V-6-A, 4-wire △, 3-phase, below Serial No. 20528047 (with transformers)

Fig. 35. Types V-3-A, V-5-A, and V-6-A meters (also applicable to Types VM-3-A, VM-5-A, VM-6-A, VW-3-A, VW-5-A, and VW-6-A)

www.manualsplus.com
1018658

TERMINAL ARRANGEMENT AND MARKING

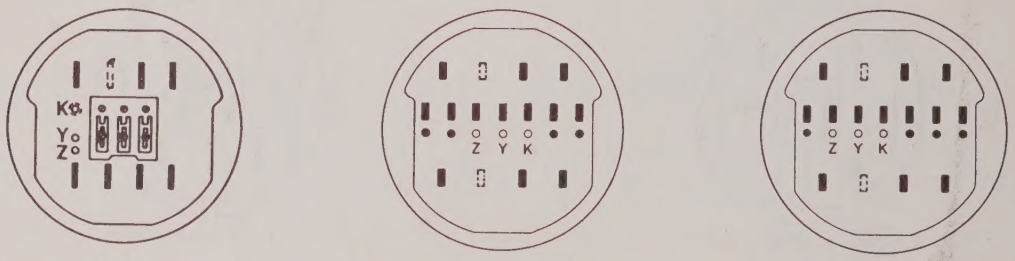


a. Types V-3-S and VW-3-S, 3-wire, 1-, 2-, and 3-phase, and 4-wire, 2-phase (without transformers) below Serial No. 20111350

b. Types V-3-S and VW-3-S, 3-wire, 1-, 2-, and 3-phase, and 4-wire, 2-phase (without transformers. Serial No. 20111350 and above; with transformers, all Serial Numbers)

c. Type V-5-S, 4-wire Y, 3-phase (without transformers)

d. Type V-5-S, 4-wire Y, 3-phase (with transformers)



e. Type V-6-S, 4-wire Δ, 3-phase (without transformers)

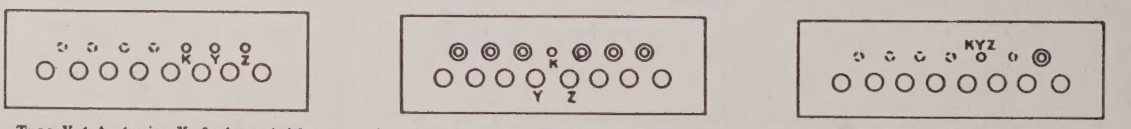
f. Types V-5-S, VW-5-S and VM-5-S 4-wire Y, 3-phase, with transformers (13-terminal base)

g. Types V-6-S, VW-6-S and VM-6-S 4-wire Δ, 3-phase with transformers (13-terminal base)

NOTES:

1. Potential terminals are identified by white markings ●. 2. On VW meters: a. Contact device leads identified by red markings. b. Leads K, Y, and Z are used for 3-wire contact devices. c. Leads K and Z are used for 3-wire contact devices. d. Circle ◌ indicates location of 3-conductor cable for contact device connections.

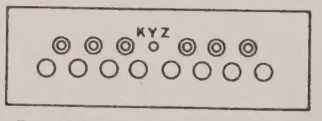
Fig. 36. Types V-3-S, V-5-S, and V-6-S meters (also applicable to Types VM-3-S, VM-5-S, VM-6-S, VW-3-S, VW-5-S, and VW-6-S). Back views



a. Type V-4-A, 4-wire Y, 3-phase (without transformer); Type V-7-A, 4-wire Δ, 3-phase (without transformer)

b. Type V-4-A, 4-wire Y, 3-phase (with transformer); Type V-7-A, 4-wire Δ, 3-phase (with transformer)

c. Type V-10-A, totalizing 3-wire, 3-phase plus 3-wire, single-phase (without transformers)



d. Type V-10-A, totalizing 3-wire, 3-phase plus 3-wire, single-phase (with transformers)

NOTES:
1. Potential terminals are identified by white markings, ◎.
2. On VW-4-A, VW-7-A, and VW-10-A meters only:
   a. Terminals K, Y, and Z used for 3-wire contact devices.
   b. Terminals K and Z used for 2-wire contact devices.
   c. Contact device terminals identified by red markings.

Fig. 37. Types V-4-A, V-7-A, and V-10-A meters (also applicable to corresponding types with letters M or W added to the type letters)